

WHAT IS CLAIMED IS:

1. A multi-function opto-electronic detection apparatus for detecting molecular characteristics of a test sample comprising:
 - 5 a detecting light source subsystem generating sampling beams for illuminating said test sample;
 - a manipulation optics subsystem aligning said sampling beam onto said test sample;
 - a target signal processing subsystem analyzing target beams emerging from said test sample resulting from said illuminating of said sampling beam; and
 - 10 a sample fixation subsystem holding said test sample; wherein said detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem being assembled into one of a plurality of possible optical sampling setups for the detection of said test sample.
- 15 2. The multi-function opto-electronic detection apparatus of claim 1, wherein said detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem are assembled into an ellipsometer for detecting ellipsometric characteristics of said test sample.
- 20 3. The multi-function opto-electronic detection apparatus of claim 1, wherein said detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem are assembled into a confocal scanner for detecting surface plasmon resonance characteristics of said test sample.
- 25 4. The multi-function opto-electronic detection apparatus of claim 1, wherein said detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem are assembled into a confocal scanner for detecting amplitude surface plasmon resonance characteristics of said test sample.
- 30 5. The multi-function opto-electronic detection apparatus of claim 1, wherein said detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem are assembled into a photon tunneling scanning microscope for observing characteristics of said test sample.

6. The multi-function opto-electronic detection apparatus of claim 1, wherein said detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem are assembled into an interferometer for detecting phase
5 interferometric characteristics of said test sample.

7. The multi-function opto-electronic detection apparatus of claim 1, wherein said detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem are assembled into an interferometer for detecting optical coherence
10 tomographic characteristics of said test sample.

8. The multi-function opto-electronic detection apparatus of claim 1, wherein said detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem are assembled into a Doppler interferometer for detecting
15 characteristics of said test sample.

9. A multi-function opto-electronic detection apparatus for detecting molecular characteristics of a test sample comprising:

a detecting light source subsystem, comprising a linear polarized light source, a
20 phase modulator, an optical reference signal generator, and a light path adjustment unit;

a manipulation optics subsystem aligning said sampling beam onto said test sample and comprising an optical alignment control, and an observe and control lens set;

a target signal processing subsystem analyzing target beams emerging from said test sample resulting from said illuminating of said sampling beam and comprising an
25 interferometric optical signal analysis unit and a scanning signal analysis unit; and

a sample fixation subsystem holding said test sample and comprising a test sample support; wherein

detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem being assembled into one of a plurality of possible optical sampling
30 setups in which said phase modulator modulating phase of a light beam generated by said linear polarized light source and directing a reference beam to said optical reference signal generator and a sampling beam to said optical alignment control; said optical alignment control aligning said sampling beam onto said test sample and generating a target signal

beam therefrom and directing to said target signal processing subsystem; and said target signal processing subsystem analyzing said target signal beam for resolving said characteristics of said test sample

5 10. A multi-function opto-electronic detection apparatus for detecting biomolecular characteristics of a test sample comprising:

 a detecting light source subsystem generating sampling beams for illuminating said test sample;

 a manipulation optics subsystem aligning said sampling beam onto said test sample;

10 a target signal processing subsystem analyzing target beams emerging from said test sample resulting from said illuminating of said sampling beam; and

 a sample fixation subsystem holding said test sample; wherein

 said detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem being assembled into one of a plurality of possible optical
15 sampling setups for the detection of said test sample.

 11. A multi-function opto-electronic detection apparatus for detecting biomolecular characteristics of a test sample comprising:

 a detecting light source subsystem, comprising a linear polarized light source, a
20 phase modulator, an optical reference signal generator, and a light path adjustment unit;

 a manipulation optics subsystem aligning said sampling beam onto said test sample and comprising an optical alignment control, and an observe and control lens set;

 a target signal processing subsystem analyzing target beams emerging from said test sample resulting from said illuminating of said sampling beam and comprising an
25 interferometric optical signal analysis unit and a scanning signal analysis unit; and

 a sample fixation subsystem holding said test sample and comprising a test sample support; wherein

 detecting light source subsystem, manipulation optics subsystem and target signal processing subsystem being assembled into one of a plurality of possible optical sampling
30 setups in which said phase modulator modulating phase of a light beam generated by said linear polarized light source and directing a reference beam to said optical reference signal generator and a sampling beam to said optical alignment control; said optical alignment control aligning said sampling beam onto said test sample and generating a target signal

beam therefrom and directing to said target signal processing subsystem; and said target signal processing subsystem analyzing said target signal beam for resolving said characteristics of said test sample